

We claim:

1. A process for the production of fine chemical, which comprises

a) increasing or generating the biological activity represented by a protein as depicted in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392 or 394 in a non-human organism, or in one or more parts thereof; and

b) growing the organism under conditions which permit the production of the fine chemical in said organism.

2. A process for the production of fine chemical, comprising the increasing or generating in an organism or a part thereof the expression of at least one nucleic acid molecule comprising a nucleic acid molecule selected from the group consisting of:

a) nucleic acid molecule encoding of the polypeptide as depicted in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392 or 394 or a fragment thereof, which confers an increase in the amount of fine chemical in an organism or a part thereof;

- 5      b)    nucleic acid molecule comprising of the nucleic acid molecule as depicted in  
SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35,  
37, 39, 41 43, 45, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83,  
85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117,  
119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147,  
149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177,  
179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207,  
209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237,  
239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267,  
10    269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297,  
299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327,  
329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357,  
359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387,  
389, 391 or 393;
- 15      c)    nucleic acid molecule whose sequence can be deduced from a polypeptide  
sequence encoded by a nucleic acid molecule of (a) or (b) as a result of the  
degeneracy of the genetic code and conferring an increase in the amount of  
fine chemical in an organism or a part thereof;
- 20      d)    nucleic acid molecule which encodes a polypeptide which has at least 50%  
identity with the amino acid sequence of the polypeptide encoded by the  
nucleic acid molecule of (a) to (c) and conferring an increase in the amount  
of fine chemical in an organism or a part thereof;
- 25      e)    nucleic acid molecule which hybridizes with a nucleic acid molecule of (a) to  
(c) under stringent hybridization conditions and conferring an increase in the  
amount of fine chemical in an organism or a part thereof;
- 30      f)    nucleic acid molecule which encompasses a nucleic acid molecule which is  
obtained by amplifying nucleic acid molecules from a cDNA library or a  
genomic library using the primers in SEQ ID NO: 53 or SEQ ID NO: 54 and  
conferring an increase in the amount of the fine chemical in an organism or  
a part thereof;
- 35      g)    nucleic acid molecule encoding a polypeptide which is isolated with the aid  
of monoclonal antibodies against a polypeptide encoded by one of the  
nucleic acid molecules of (a) to (f) and conferring an increase in the amount  
of fine chemical in an organism or a part thereof;
- h)    nucleic acid molecule encoding a polypeptide comprising the consensus  
sequence as depicted in SEQ ID NO: 47, SEQ ID NO: 48, SEQ ID NO: 49,  
SEQ ID NO: 50, SEQ ID NO: 51, SEQ ID NO: 52, SEQ ID NO: 397, SEQ ID  
NO: 398, SEQ ID NO: 399 and/or SEQ ID NO: 400 and conferring an

increase in the amount of the fine chemical in an organism or a part thereof;  
and

- 5 i) nucleic acid molecule which is obtainable by screening a suitable nucleic acid library under stringent hybridization conditions with a probe comprising one of the sequences of the nucleic acid molecule of (a) to (k) or with a fragment thereof having at least 15 nt, preferably 20 nt, 30 nt, 50 nt, 100 nt, 200 nt or 500 nt of the nucleic acid molecule characterized in (a) to (k) and conferring an increase in the amount of the fine chemical in an organism or a part thereof.
- 10 or comprising a sequence which is complementary thereto.
3. The process of claim 1 or 2, comprising recovering of the free or bound fine chemical.
4. The process of any one of claim 1 to 3, comprising the following steps:
- 15 (a) selecting an organism or a part thereof expressing a polypeptide encoded by the nucleic acid molecule characterized in claim 2;
- (b) mutagenizing the selected organism or the part thereof;
- (c) comparing the activity or the expression level of said polypeptide in the mutagenized organism or the part thereof with the activity or the expression of said polypeptide of the selected organisms or the part thereof;
- 20 (d) selecting the mutated organisms or parts thereof, which comprise an increased activity or expression level of said polypeptide compared to the selected organism or the part thereof;
- (e) optionally, growing and cultivating the organisms or the parts thereof; and
- 25 (f) recovering, and optionally isolating, the free or bound fine chemical produced by the selected mutated organisms or parts thereof.
5. The process of any one of claims 1 to 4, wherein the activity of said protein or the expression of said nucleic acid molecule is increased or generated transiently or stably.
- 30 6. An isolated nucleic acid molecule comprising a nucleic acid molecule selected from the group consisting of:
- (a) nucleic acid molecule encoding of the polypeptide as depicted in SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88,

- 5 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392 or 394 or a fragment thereof, which confers an increase in the amount of fine chemical in an organism or a part thereof;
- 10
- 15 (b) nucleic acid molecule comprising of the nucleic acid molecule as depicted in SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41 43, 45, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391 or 393 or a fragment thereof, which confers an increase in the amount of fine chemical in an organism or a part thereof;
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- 25
- 30 (c) nucleic acid molecule whose sequence can be deduced from a polypeptide sequence encoded by a nucleic acid molecule of (a) or (b) as a result of the degeneracy of the genetic code and conferring an increase in the amount of fine chemical in an organism or a part thereof;
- 35 (d) nucleic acid molecule which encodes a polypeptide which has at least 50% identity with the amino acid sequence of the polypeptide encoded by the nucleic acid molecule of (a) to (c) and conferring an increase in the amount of fine chemical in an organism or a part thereof;
- (e) nucleic acid molecule which hybridizes with a nucleic acid molecule of (a) to (c) under stringent hybridization conditions and conferring an increase in the amount of fine chemical in an organism or a part thereof;

- 5 (f) nucleic acid molecule which encompasses a nucleic acid molecule which is obtained by amplifying nucleic acid molecules from a cDNA library or a genomic library using the primers in SEQ ID NO: 53 or SEQ ID NO: 54 and conferring an increase in the amount of the fine chemical in an organism or a part thereof;
- (g) nucleic acid molecule encoding a polypeptide which is isolated with the aid of monoclonal and/or polyclonal antibodies against a polypeptide encoded by one of the nucleic acid molecules of (a) to (f) and conferring an increase in the amount of fine chemical in an organism or a part thereof;
- 10 (h) nucleic acid molecule encoding a polypeptide comprising the consensus sequence as depicted in SEQ ID NO: 47, SEQ ID NO: 48, SEQ ID NO: 49, SEQ ID NO: 50, SEQ ID NO: 51, SEQ ID NO: 52, SEQ ID NO: 397, SEQ ID NO: 398, SEQ ID NO: 399 and/or SEQ ID NO: 400 and conferring an increase in the amount of the fine chemical in an organism or a part thereof;
- 15 and
- (i) nucleic acid molecule which is obtainable by screening a suitable nucleic acid library under stringent hybridization conditions with a probe comprising one of the sequences of the nucleic acid molecule of (a) to (k) or with a fragment thereof having at least 15 nt, preferably 20 nt, 30 nt, 50 nt, 100 nt, 200 nt or 500 nt of the nucleic acid molecule characterized in (a) to (k) and conferring an increase in the amount of the fine chemical in an organism or a part thereof,
- 20
- whereby the nucleic acid molecule distinguishes over the sequence as depicted in SEQ ID NO: 1, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391 or 393 by one or more nucleotides.
- 30
- 35 7. A nucleic acid construct which confers the expression of the nucleic acid molecule of claim 6, comprising one or more regulatory elements.
8. A vector comprising the nucleic acid molecule as claimed in claim 6 or the nucleic acid construct of claim 7.

9. The vector as claimed in claim 8, wherein the nucleic acid molecule is in operable linkage with regulatory sequences for the expression in a prokaryotic or eukaryotic, or in a prokaryotic and eukaryotic, host.
- 5 10. A host cell, which has been transformed stably or transiently with the vector as claimed in claim 8 or 9 or the nucleic acid molecule as claimed in claim 6 or the nucleic acid construct of claim 7 or produced as described in claim any one of claims 2 to 4.
11. The host cell of claim 10, which is a transgenic host cell.
- 10 12. The host cell of claim 10 or 11, which is a plant cell, an animal cell, a microorganism, or a yeast cell, a fungus cell, a prokaryotic cell, an eukaryotic cell or an archaeobacterium.
13. A process for producing a polypeptide, wherein the polypeptide is expressed in a host cell as claimed in any one of claims 9 to 11.
- 15 14. A polypeptide produced by the process as claimed in claim 13 or encoded by the nucleic acid molecule as claimed in claim 6 whereby the polypeptide distinguishes over the sequence as depicted in SEQ ID NO: 2, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 20 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 25 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392 or 394 by one or more amino acids.
15. An antibody, which binds specifically to the polypeptide encoded by a nucleic acid sequence as claimed in claim 6 a).
- 30 16. A plant tissue, propagation material, harvested material or a plant comprising the host cell as claimed in claim 12, which is plant cell or an Agrobacterium.
17. A method for screening for agonists and antagonists of the activity of a polypeptide encoded by the nucleic acid molecule of claim 6 conferring an increase in the amount of fine chemical in an organism or a part thereof 35 comprising:

- 5 (a) contacting cells, tissues , plants or microorganisms which express the a polypeptide encoded by the nucleic acid molecule of claim 6 conferring an increase in the amount of the fine chemical in an organism or a part thereof with a candidate compound or a sample comprising a plurality of compounds under conditions which permit the expression the polypeptide;
- (b) assaying the fine chemical level or the polypeptide expression level in the cell, tissue, plant or microorganism or the media the cell, tissue, plant or microorganisms is cultured or maintained in; and
- 10 (c) identifying a agonist or antagonist by comparing the measured fine chemical level or polypeptide expression level with a standard fine chemical or polypeptide expression level measured in the absence of said candidate compound or a sample comprising said plurality of compounds, whereby an increased level over the standard indicates that the compound or the sample comprising said plurality of compounds is an agonist and a
- 15 decreased level over the standard indicates that the compound or the sample comprising said plurality of compounds is an antagonist.
18. A process for the identification of a compound conferring increased fine chemical production in a plant or microorganism, comprising the steps:
- 20 (a) culturing a plant cell or tissue or microorganism or maintaining a plant expressing the polypeptide encoded by the nucleic acid molecule of claim 6 conferring an increase in the amount of the fine chemical in an organism or a part thereof and a readout system capable of interacting with the polypeptide under suitable conditions which permit the interaction of the polypeptide with dais readout system in the presence of a compound or a
- 25 sample comprising a plurality of compounds and capable of providing a detectable signal in response to the binding of a compound to said polypeptide under conditions which permit the expression of said readout system and of the polypeptide encoded by the nucleic acid molecule of claim 6 conferring an increase in the amount of the fine chemical in an
- 30 organism or a part thereof;
- (b) identifying if the compound is an effective agonist by detecting the presence or absence or increase of a signal produced by said readout system.
19. A method for the identification of a gene product conferring an increase in the fine chemical production in a cell, comprising the following steps:
- 35 (a) contacting the nucleic acid molecules of a sample, which can contain a candidate gene encoding a gene product conferring an increase in fine chemical after expression with the nucleic acid molecule of claim 6;

- (b) identifying the nucleic acid molecules, which hybridize under relaxed stringent conditions with the nucleic acid molecule of claim 6;
  - (c) introducing the candidate nucleic acid molecules in host cells appropriate for producing the fine chemical;
  - 5 (d) expressing the identified nucleic acid molecules in the host cells;
  - (e) assaying the fine chemical level in the host cells; and
  - (f) identifying nucleic acid molecule and its gene product which expression confers an increase in the fine chemical level in the host cell in the host cell after expression compared to the wild type.
- 10 20. A method for the identification of a gene product conferring an increase in fine chemical production in a cell, comprising the following steps:
- (a) identifying in a data bank nucleic acid molecules of an organism; which can contain a candidate gene encoding a gene product conferring an increase in the fine chemical amount or level in an organism or a part thereof after expression, and which are at least 30% homolog to the nucleic acid molecule of claim 6;
  - 15 (b) introducing the candidate nucleic acid molecules in host cells appropriate for producing the fine chemical;
  - (c) expressing the identified nucleic acid molecules in the host cells;
  - 20 (d) assaying the fine chemical level in the host cells; and
  - (e) identifying nucleic acid molecule and its gene product which expression confers an increase in the fine chemical level in the host cell after expression compared to the wild type.
- 25 21. A method for the production of an agricultural composition comprising the steps of the method of any one of claims 17 to 20 and formulating the compound identified in any one of claims 17 to 20 in a form acceptable for an application in agriculture.
- 30 22. A composition comprising the nucleic acid molecule of claim 6, the polypeptide of claim 14, the nucleic acid construct of claim 7, the vector of any one of claims 8 or 9, an antagonist or agonist identified according to claim 17, the compound of claim 18, the gene product of claim 19 or 20, the antibody of claim 15, and optionally an agricultural acceptable carrier.



23. Use of the nucleic acid molecule as claimed in claim 6 for the identification of a nucleic acid molecule conferring an increase of the fine chemical after expression.
- 5 24. Use of the polypeptide of claim 14 or the nucleic acid construct claim 7 or the gene product identified according to the method of claim 18 or 19 for identifying compounds capable of conferring a modulation of the fine chemical levels in an organism.
- 10 25. Food or feed composition comprising the nucleic acid molecule of claim 6, the polypeptide of claim 14, the nucleic acid construct of claim 7, the vector of claim 8 or 9, the antagonist or agonist identified according to claim 17, the antibody of claim 15, the plant or plant tissue of claim 16, the harvested material of claim 16, the host cell of claim 10 to 12 or the gene product identified according to the method of claim 19 or 20.
- 15 26. Use of the nucleic acid molecule as claimed in claim 6 in mapping and breeding processes for the identification of plant varieties having and increased capacity for production of the fine chemical.